

SEQUENCE LISTING

<110> Cahoon, Edgar B.
 Kinney, Anthony
 Klein, Thodore
 Lee, Jian Ming
 Pearlstein, Richard
 Rafalski, J. Antoni
 Shen, Jennie
 Thorpe, Cathy
 Tingey, Scott
 Weng, Zude

<120> Plant Lipoxygenases

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<150> 60/119,597
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 Arg Val Thr Asn Ile Gly Gly Lys Lys Ile Lys Gly Thr Val Val Leu
 35 40 45
 Met Arg Ser Asn Val Leu Asp Phe Thr Glu Phe His Ser Ser Leu Leu
 50 55 60

Asp Gly Val Thr Glu Leu Leu Gly Gly Gly Ile Ser Leu Gln Leu Ile
 65 70 75 80
 Ser Ala Thr His Ala Ser Asn Asp Ser Arg Gly Lys Val Gly Lys Gly
 85 90 95
 Ala Phe Leu Glu Arg Trp Leu Thr Ser Val Pro Pro Leu Phe Ala Gly
 100 105 110
 Glu Ser Val Phe Gln Val Asn Phe Leu Gly Arg Glu Leu Trp Asp Phe
 115 120 125
 Gln Gly Ala Phe Phe Ile Lys Asn Gly His Thr Ser Glu Phe Phe Leu
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 145 150 155 160
 Cys Asn Ser Xaa Val Xaa Pro Ser Arg Arg
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 Thr Tyr Ala Ser Arg Thr Leu Leu Ile Leu Arg Lys Asp Gly Thr Leu
 35 40 45
 Met Pro Leu Ala Ile Glu Leu Ser Leu Pro Asn Pro Arg Gly Asp Glu
 50 55 60
 Tyr Gly Ala Ile Cys Lys Val Tyr Thr Pro Ala Gln His Gly Val Glu
 65 70 75 80
 Ala Ser Leu Trp Gln Leu Ala Xaa Ala Tyr Val Val Val Asn Asp Ser
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 Cys Ile His Glu Ser Val
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 cgacgacatc ggcgacctcc tcggcaagac gctgctgctc gagctcgtca gctccgagct 240
 cgacgcaaag tcgggcggtg agaaaacgcg ggtgacggcg tacgcgcaca agacgctgcg 300
 ggagggccac tacgaggcgg agttcaaggt gccggcgctc ttcggggccg tgggcgcggt 360
 gctggtggag aacgagcacc acaaggaggt cttcatcaag gagatcaagc tcgtcaccgg 420
 cggcgacagc agcaccgccg tcaccttcga ctgcaactcc tgggtgcact ccaagttcga 480
 caaccgggag aagcgcatct tcttcacct caagtcatac ctgccgtccg acacgcccac 540
 ggggctggag gacctgagga agaaagacct gcaggcgctg cgcggcgacg ggcacggcga 600
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His Tyr Glu Ala Glu Phe Lys Val Pro Ala Ser Phe Gly Pro Val Gly
 35           40           45

Ala Val Leu Val Glu Asn Glu His His Lys Glu Val Phe Ile Lys Glu
 50           55           60

Ile Lys Leu Val Thr Gly Gly Asp Ser Ser Thr Ala Val Thr Phe Asp
 65           70           75           80

Cys Asn Ser Trp Val His Ser Lys Phe Asp Asn Pro Glu Lys Arg Ile
 85           90           95

Phe Phe Thr Leu Lys Ser Tyr Leu Pro Ser Asp Thr Pro Lys Gly Leu
100           105           110

Glu Asp Leu Arg Lys Lys Asp Leu Gln Ala Leu Arg Gly Asp Gly His
115           120           125

Gly Glu Arg Lys Val Phe Glu Arg Val Tyr Asp Tyr Asp Val Tyr Asn
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Glu Leu Gly
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 cacatcacat cggcaggcga gggacggagc gagcagggaa gcccatccac cagccagcca 180
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 Cys Leu Ala Ser Leu Ile Ala Gly Thr Ser His Arg Gln Ala Arg Asp
 35 40 45
 Gly Ala Ser Arg Glu Ala His Pro Pro Ala Ser His Arg Val Pro Glu
 50 55 60
 Lys Arg Arg Ala Arg Lys Gly Glu Xaa Ala Xaa Met Phe Trp His Gly
 65 70 75 80
 Val Ala Asp Arg Leu Thr Gly Lys Asn Lys Glu Ala Trp Ser Glu Gly
 85 90 95
 Lys Ile Arg Gly Thr Val Arg Leu Val Lys Lys Glu Val Leu Asp Val
 100 105 110

Gly Asp Phe Asn Ala Ser Leu Leu Asp Gly Val His Arg Ile Leu Gly
115 120 125

Trp Asp Asp Gly Val Ala Phe Ser Ser Ser Ala Pro Pro Arg Ala Thr
130 135 140

Pro Ala Thr Gly Ala Val Ala Arg Trp Gly Arg Arg Arg Thr Trp Arg
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 cagcaacaag aatgcgcacc tcaagggcaa cgtggtgctc gtgcgcaaga cgtgctcgg 180
 cttggacgtc accagcatcg cgggtccct cctcgacggc gtgcggcaggt tcctcggccg 240
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His Leu Lys Gly Asn Val Val Leu Val Arg Lys Thr Val Leu Gly Leu
35 40 45

Asp Val Thr Ser Ile Ala Gly Ser Leu Leu Asp Gly Val Gly Glu Phe
50 55 60

Leu Gly Arg Gly Val Thr Cys Gln Leu Ile Ser Ser Thr Val Val Asp
65 70 75 80

Pro Asn Asn Gly Asn Arg Gly Lys Leu Gly Ala Glu Ala Ser Leu Glu
85 90 95

Gln Trp Leu Leu Asn Pro Pro Pro Leu Leu Ser Ser Glu Asn Gln Phe
100 105 110

Arg Val Thr Phe Asp Trp Glu Val Glu Lys Gln Gly Ile Pro Gly Ala
115 120 125

Ile Ile Val Lys Asn Asn His Ala Xaa Glu Xaa Phe Leu Lys Thr Ile
130 135 140

Thr Leu Asn Asp Val Pro Gly Thr Gly Pro Ser Ser Ser Ser Pro Thr
145 150 155 160

His Gly Ser Thr Arg Ser Pro Ser Thr Ala Thr Thr Ala Ser Ser Ser
165 170 175

Pro Thr Thr Arg Thr Phe Pro Ser Gln Met Pro Ala Ala Leu Lys Pro
180 185 190

Thr Xaa Thr Thr Ala Ser Gly Thr Xaa Thr Ile Val Phe Val Ala Asn
195 200 205

Ser Trp Ile Tyr Pro Gln Ser Lys Tyr Arg Tyr Asn Arg Val Phe Phe
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Ser Asn Asp Thr Tyr Leu Pro Lys Pro Asp Ala Gly Gly Ala Glu Ala
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 Arg Val Thr Asn Ile Gly Gly Lys Lys Ile Lys Gly Thr Val Val Leu
 35 40 45

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Ser	Ala	Thr	His	Ala	Ser	Asn	Asp	Ser	Arg	Gly	Lys	Val	Gly	Lys	Gly	85	90	95
Ala	Phe	Leu	Glu	Arg	Trp	Leu	Thr	Ser	Val	Pro	Pro	Leu	Phe	Ala	Gly	100	105	110
Glu	Ser	Val	Phe	Gln	Val	Asn	Phe	Asp	Trp	Glu	Glu	Asn	Phe	Gly	Phe	115	120	125
Pro	Gly	Ala	Phe	Phe	Ile	Lys	Asn	Gly	His	Thr	Ser	Glu	Phe	Phe	Leu	130	135	140
Lys	Ser	Val	Thr	Leu	Glu	Asp	Val	Pro	Gly	Phe	Gly	Arg	Val	His	Phe	145	150	155
Asp	Cys	Asn	Ser	Trp	Val	Tyr	Pro	Ser	Arg	Arg	Tyr	Lys	Lys	Asp	Arg	165	170	175
Ile	Phe	Phe	Ala	Asn	His	Thr	Cys	Leu	Pro	Ile	Asp	Thr	Pro	Asp	Ser	180	185	190
Leu	Arg	Lys	Tyr	Arg	Glu	Glu	Glu	Leu	Leu	Asn	Leu	Arg	Gly	Asp	Gly	195	200	205
Thr	Gly	Glu	Arg	Lys	Glu	Trp	Asp	Arg	Ile	Tyr	Asp	Tyr	Asp	Val	Tyr	210	215	220
Asn	Asp	Leu	Cys	Asp	Pro	Asn	Gly	Gly	Pro	Asn	Leu	Val	Arg	Pro	Ile	225	230	235
Leu	Gly	Gly	Ser	Asp	Gln	Tyr	Pro	Tyr	Pro	Arg	Arg	Gly	Arg	Thr	Gly	245	250	255
Arg	Pro	Pro	Ala	Arg	Lys	Asp	His	Lys	Tyr	Glu	Ser	Arg	Leu	Ser	Asp	260	265	270
Val	Met	Ser	Leu	Asn	Ile	Tyr	Val	Pro	Arg	Asp	Glu	Asn	Phe	Gly	His	275	280	285
Leu	Lys	Met	Ala	Asp	Phe	Leu	Gly	Asn	Thr	Leu	Lys	Val	Leu	Ser	Thr	290	295	300
Ser	Ile	Gln	Pro	Gly	Leu	Glu	Ser	Ile	Phe	Asp	Ser	Thr	Pro	Gly	Glu	305	310	315
Phe	Asp	Lys	Phe	Lys	Glu	Val	Asp	Asp	Leu	Phe	Glu	Arg	Gly	Phe	Pro	325	330	335
Ile	Pro	Leu	Asn	Ile	Phe	Lys	Asn	Leu	Thr	Glu	Asp	Leu	Ala	Pro	Pro	340	345	350
Leu	Phe	Lys	Ala	Phe	Leu	Arg	Ser	Asp	Gly	Glu	Arg	Phe	Leu	Lys	Tyr	355	360	365

Pro	Thr	Pro	Gln	Val	Ile	Lys	Asp	Asn	Lys	Leu	Gly	Trp	Arg	Thr	Asp
370						375				380					
Glu	Glu	Phe	Ala	Arg	Glu	Met	Ile	Ala	Gly	Val	Asn	Pro	Leu	Ile	Ile
385					390					395					400
Arg	Arg	Leu	Glu	Val	Phe	Pro	Pro	Leu	Ser	Lys	Leu	Asp	Pro	His	Val
				405					410					415	
Tyr	Gly	Asn	Gln	Asn	Ser	Thr	Met	Thr	Glu	Glu	Gln	Ile	Lys	His	Gly
			420					425					430		
Leu	Asp	Gly	Leu	Thr	Val	Asp	Glu	Ala	Ile	Lys	Glu	Asn	Lys	Leu	Tyr
		435					440					445			
Ile	Leu	Asp	His	His	Asp	Ala	Leu	Met	Pro	Tyr	Leu	Arg	Arg	Ile	Asn
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Ser	Thr	Ser	Thr	Lys	Thr	Tyr	Ala	Thr	Arg	Thr	Leu	Leu	Phe	Leu	Lys
465					470					475					480
Asp	Asp	Ser	Thr	Leu	Lys	Pro	Leu	Ala	Ile	Glu	Leu	Ser	Leu	Pro	His
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Pro	Gln	Gly	Asp	Glu	His	Gly	Ala	Ile	Ser	Lys	Leu	Tyr	Phe	Pro	Ala
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Glu	Gly	Arg	Val	Glu	Ser	Ala	Ile	Trp	Gln	Leu	Ala	Lys	Ala	Tyr	Val
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Ala	Val	Asn	Asp	Ser	Gly	Tyr	His	Gln	Leu	Asn	Ser	His	Trp	Leu	His
		530				535					540				
Thr	His	Ala	Val	Leu	Glu	Pro	Phe	Val	Ile	Thr	Thr	His	Arg	Arg	Leu
545					550					555					560
Ser	Val	Leu	His	Pro	Ile	His	Lys	Leu	Leu	Ala	Pro	His	Tyr	Lys	Asp
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Thr	Met	Phe	Ile	Asn	Ala	Ser	Ala	Arg	Gln	Val	Leu	Ile	Asn	Ala	Gly
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Gly	Leu	Ile	Glu	Ser	Thr	Gln	Phe	Pro	Ala	Lys	Tyr	Ala	Met	Glu	Leu
		595					600					605			
Ser	Ser	Tyr	Ile	Tyr	Lys	Glu	Trp	Lys	Phe	Pro	Asp	Glu	Ala	Leu	Pro
		610				615					620				
Thr	Asn	Leu	Ile	Lys	Arg	Gly	Val	Ala	Ile	Glu	Asp	Ser	Gly	Ser	Pro
625					630					635					640
His	Gly	Val	Arg	Leu	Leu	Ile	Asn	Asp	Tyr	Pro	Phe	Ala	Val	Asp	Gly
				645					650					655	
Leu	Glu	Ile	Trp	Ser	Ala	Ile	Lys	Thr	Trp	Val	Thr	Asp	Tyr	Cys	Ser
			660					665					670		
Leu	Tyr	Tyr	Lys	Asp	Asp	Asp	Ala	Ile	Arg	Asn	Asp	Val	Glu	Leu	Gln
		675					680					685			

Ser Trp Trp Lys Glu Leu Arg Glu Lys Gly His Thr Asp Lys Lys Asp
690 695 700

Glu Pro Trp Trp Pro Lys Met Gln Thr Phe Ser Glu Leu Ile Glu Ser
705 710 715 720

Cys Thr Ile Ile Ile Trp Ile Ser Ser Ala Leu His Ala Ala Val Asn
725 730 735

Phe Gly Gln Tyr Pro Tyr Gly Gly Tyr Val Pro Asn Arg Pro Thr Thr
740 745 750

Ser Arg Arg Phe Met Pro Glu Val Gly Thr Ala Glu Tyr Lys Glu Val
755 760 765

Glu Ser Asn Pro Glu Lys Ala Phe Leu Arg Thr Ile Ser Ser Gln Ile
770 775 780

Val Ala Leu Leu Gly Leu Ser Ile Ile Glu Ile Leu Ser Lys His Ala
785 790 795 800

Ser Asp Glu Val Tyr Leu Gly Gln Arg Ala Ser Ile Glu Trp Thr Ser
805 810 815

Asp Lys Ser Ala Ile Glu Ala Phe Glu Lys Phe Gly Lys Glu Leu Phe
820 825 830

Glu Val Glu Asp Arg Ile Met Arg Arg Asn Gln Asp Val Asn Leu Lys
835 840 845

Asn Arg Ala Gly Pro Val Asn Met Pro Tyr Thr Leu Leu Val Pro Ser
850 855 860

Ser Thr Glu Gly Leu Thr Gly Arg Gly Ile Pro Asn Ser Ile Ser Ile
865 870 875 880

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<211> 1577
<212> DNA
<213> Impatiens balsamia

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tcttcttata cttaggaaaag atgggacttt gatgccatta gccattgagc taagcctgcc 180
caacccaaga ggagatgaat atggtgccat atgcaaagtc tacaccccggt ctcaacatgg 240
tgtagaagcc tccctttggc agcttgctaa agcctatgtc gtgggttaacg actctggtat 300
ccacgaactc gtcagtcatt ggttgaacac gcatgcagtg attgagccat ttgtaatcgc 360
gacaaacaga caactgagcg tacttcatcc gatacaaaaag ttgttgacc ctcattttcg 420
agacacgatg aacattaatg caatcgcaag gaatgtacta atcaacgcgg gtggagttat 480
tgagaatacg tttttcacat caaagtatat catggagatg tcatccgcaa tttacaagaa 540
ttggattttc accgaccagt ctctcccgtt ggaccttatt aaaaggggga ttgcggttaa 600
ggatgataaa gaaaaacgcg gtcttcgcat actcatagag gattaccggt atgcggttga 660
cgggctagag atatggtttg cgataaaagac atgggtcgag gactattgag acttctacta 720
caaaggcgac gaggcagtta agaattgacac cgagctccaa gcatgggtgga aggagctaaa 780
ggaagtggc cacggagaca aaaggaatga accgtggtgg cccaaaatgg aaacaaggaa 840
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gaatttcggg caatacccat atggcgata ccatacctaac cggcccacaa atagccgaag 960
gctaattgcc gaagtgggta gtcctgaatt cgaggagttg aagacaaatc cggaccaa 1020
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ataattgtct ttattgtttg tattaaaatg tatcccacta tgtaattata tacatatatta 1500
tgaaataaat gtatttgtat ggtaaaaaaa aaaaaaaaaa aaaaaaaaaa aaaaaaaaaa 1560
aaaaaaaaaa aaaaaaa                                     1577

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<210> 14
<211> 445
<212> PRT
<213> Impatiens balsamia

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His His Asp Ser Leu Met Pro Tyr Leu Gly Arg Ile Asn Thr Thr Thr
          20          25          30
Thr Lys Thr Tyr Ala Ser Arg Thr Leu Leu Ile Leu Arg Lys Asp Gly
          35          40          45
Thr Leu Met Pro Leu Ala Ile Glu Leu Ser Leu Pro Asn Pro Arg Gly
          50          55          60
Asp Glu Tyr Gly Ala Ile Cys Lys Val Tyr Thr Pro Ala Gln His Gly
          65          70          75          80
Val Glu Ala Ser Leu Trp Gln Leu Ala Lys Ala Tyr Val Val Val Asn
          85          90          95
Asp Ser Gly Ile His Glu Leu Val Ser His Trp Leu Asn Thr His Ala
          100          105          110
Val Ile Glu Pro Phe Val Ile Ala Thr Asn Arg Gln Leu Ser Val Leu
          115          120          125
His Pro Ile Gln Lys Leu Leu His Pro His Phe Arg Asp Thr Met Asn
          130          135          140
Ile Asn Ala Ile Ala Arg Asn Val Leu Ile Asn Ala Gly Gly Val Ile
          145          150          155          160
Glu Asn Thr Phe Phe Thr Ser Lys Tyr Ser Met Glu Met Ser Ser Ala
          165          170          175
Ile Tyr Lys Asn Trp Ile Phe Thr Asp Gln Ser Leu Pro Val Asp Leu
          180          185          190
Ile Lys Arg Gly Ile Ala Val Lys Asp Asp Lys Glu Lys Arg Gly Leu
          195          200          205
Arg Leu Leu Ile Glu Asp Tyr Pro Tyr Ala Val Asp Gly Leu Glu Ile
          210          215          220
Trp Phe Ala Ile Lys Thr Trp Val Glu Asp Tyr Cys Asp Phe Tyr Tyr
          225          230          235          240

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Lys Gly Asp Glu Ala Val Lys Asn Asp Thr Glu Leu Gln Ala Trp Trp
245 250 255

Lys Glu Leu Lys Glu Val Gly His Gly Asp Lys Arg Asn Glu Pro Trp
260 265 270

Trp Pro Lys Met Glu Thr Arg Lys Asp Leu Leu Glu Thr Cys Thr Ile
275 280 285

Ile Ile Trp Val Ala Ser Ala Leu His Ala Ala Leu Asn Phe Gly Gln
290 295 300

Tyr Pro Tyr Gly Gly Tyr His Pro Asn Arg Pro Thr Asn Ser Arg Arg
305 310 315 320

Leu Met Pro Glu Val Gly Ser Pro Glu Phe Glu Glu Leu Lys Thr Asn
325 330 335

Pro Asp Gln Ile Leu Leu Lys Thr Leu Ser Ser Lys Ala Gln Thr Leu
340 345 350

Leu Glu Val Ala Ile Ile Glu Ile Leu Ser Arg His Thr Ser Asp Glu
355 360 365

Val Tyr Leu Gly Gln Arg Asp Thr Pro Glu Trp Thr Lys Asp Glu Glu
370 375 380

Pro Leu Lys Ala Phe Asp Lys Phe Gly Lys Lys Leu Ala Glu Ile Glu
385 390 395 400

Val Arg Ile Ile Glu Met Asn Asn Asp Glu Ser Leu Lys Asn Arg Asn
405 410 415

Gly Pro Val Lys Ile Pro Tyr Thr Leu Leu Phe Pro Thr Ser Ser Ser
420 425 430

Gly Leu Thr Gly Lys Gly Ile Ser Asn Ser Val Ser Ile
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<211> 3134
<212> DNA
<213> Zea mays

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ttattgccgg cacatcacat cggcaggcga gggacggagc gagcagggaa gcccatccac 180
cagccagcca ccgcgttcct gagaagcgag gagcgagaaa agcgaagagc ggccatgttc 240
tggaacgggg tcgcggaccg gctgacggga aagaacaagg aggcgtggag cgagggcaag 300
atccgcggga cggtgaggct ggtcaagaag gaggtgctgg acgtcggcga cttcaacgcc 360
tcgtcctcgc acggcgtcca caggatcctc ggctgggacg acggcgtcgc cttccagctc 420
gtcagcgcca ccgcggccga ccccagcaac gggggccgtg gcaagggtgg gaaggcggcg 480
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gtgagcttcg agtgggacga gtcgcagggc atcccgggcg ccgtcctggg caggaacctg 600
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cggcacccaa caaagaaaga cccaaattcg gagagcaggc ttttctctgt gaacctgaac 1020
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 <211> 887
 <212> PRT
 <213> Zea mays

<400> 16
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 Glu Val Leu Asp Val Gly Asp Phe Asn Ala Ser Leu Leu Asp Gly Val
 35 40 45
 His Arg Ile Leu Gly Trp Asp Asp Gly Val Ala Phe Gln Leu Val Ser
 50 55 60
 Ala Thr Ala Ala Asp Pro Ser Asn Gly Gly Arg Gly Lys Val Gly Lys
 65 70 75 80

Ala	Ala	His	Leu	Glu	Glu	Ala	Val	Val	Ser	Leu	Lys	Ser	Thr	Ala	Asp		
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Gly	Glu	Thr	Val	Tyr	Arg	Val	Ser	Phe	Glu	Trp	Asp	Glu	Ser	Gln	Gly		
			100					105						110			
Ile	Pro	Gly	Ala	Val	Leu	Val	Arg	Asn	Leu	Gln	His	Ala	Glu	Phe	Phe		
		115					120					125					
Leu	Lys	Thr	Leu	Thr	Leu	Glu	Gly	Val	Pro	Gly	Lys	Gly	Thr	Val	Val		
	130					135					140						
Phe	Val	Ala	Asn	Ser	Trp	Val	Tyr	Pro	His	Lys	Leu	Tyr	Ser	Gln	Glu		
145					150					155					160		
Arg	Ile	Phe	Phe	Ala	Asn	Asp	Thr	Tyr	Leu	Pro	Ser	Lys	Met	Pro	Ala		
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Ala	Leu	Val	Pro	Tyr	Arg	Gln	Asp	Glu	Leu	Lys	Ile	Leu	Arg	Gly	Asp		
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Asp	Asn	Pro	Gly	Pro	Tyr	Gln	Glu	His	Asp	Arg	Val	Tyr	Arg	Tyr	Asp		
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Tyr	Tyr	Asn	Asp	Leu	Gly	Asp	Pro	Asp	Lys	Gly	Glu	Glu	His	Ala	Arg		
	210					215					220						
Pro	Ile	Leu	Gly	Gly	Ser	Gln	Glu	His	Pro	Tyr	Pro	Arg	Arg	Cys	Arg		
225					230					235				240			
Thr	Gly	Arg	His	Pro	Thr	Lys	Lys	Asp	Pro	Asn	Ser	Glu	Ser	Arg	Leu		
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Phe	Leu	Leu	Asn	Leu	Asn	Ile	Tyr	Val	Pro	Arg	Asp	Glu	Arg	Phe	Gly		
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His	Leu	Lys	Met	Ser	Asp	Phe	Leu	Gly	Tyr	Ser	Leu	Lys	Thr	Ile	Ile		
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Glu	Ala	Val	Leu	Pro	Thr	Leu	Gly	Thr	Phe	Val	Asp	Asp	Thr	Pro	Lys		
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Glu	Phe	Asp	Ser	Phe	Glu	Asp	Ile	Leu	Gly	Leu	Tyr	Glu	Leu	Gly	Pro		
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Glu	Ala	Pro	Asn	Asn	Pro	Leu	Ile	Ala	Glu	Ile	Arg	Lys	Lys	Ile	Pro		
			325						330					335			
Ser	Glu	Phe	Leu	Arg	Ser	Ile	Leu	Pro	Asn	Gly	Ser	His	Asp	His	Pro		
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Leu	Lys	Met	Pro	Leu	Pro	Asn	Val	Ile	Lys	Ser	Asp	Val	Leu	Lys	Lys		
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Ala	Pro	Glu	Phe	Lys	Phe	Gly	Trp	Arg	Thr	Asp	Glu	Glu	Phe	Ala	Arg		
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Glu	Thr	Leu	Ala	Gly	Val	Asn	Pro	Val	Ile	Ile	Lys	Arg	Leu	Thr	Glu		
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Phe	Pro	Ala	Lys	Ser	Thr	Leu	Asp	Pro	Arg	Gln	Tyr	Gly	Asp	His	Thr		
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Ser	Lys	Ile	Thr	Glu	Ala	His	Ile	Arg	His	Asn	Met	Gly	Gly	Leu	Ser		
			420					425					430				
Val	Gln	Asn	Ala	Leu	Arg	Asn	Lys	Arg	Leu	Phe	Ile	Leu	Asp	His	His		
		435					440					445					
Asp	His	Phe	Met	Pro	Tyr	Leu	Asp	Glu	Ile	Asn	Glu	Leu	Glu	Gly	Asn		
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Phe	Ile	Tyr	Ala	Ser	Arg	Thr	Leu	Leu	Phe	Leu	Lys	Asp	Asp	Gly	Thr		
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Leu	Lys	Pro	Leu	Ala	Ile	Glu	Leu	Ser	Leu	Pro	His	Pro	Asp	Gly	Gln		
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Gln	Arg	Gly	Ala	Val	Ser	Lys	Val	Tyr	Thr	Pro	Ala	His	Thr	Gly	Val		
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		515					520					525					
Ser	Ala	Trp	His	Gln	Leu	Ile	Ser	His	Trp	Leu	Asn	Thr	His	Ala	Val		
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Ile	Glu	Pro	Phe	Val	Ile	Ala	Thr	Asn	Arg	Gln	Leu	Ser	Val	Val	His		
545					550					555					560		
Pro	Val	His	Lys	Leu	Leu	Ser	Pro	His	Tyr	Arg	Asp	Thr	Leu	Asn	Ile		
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Arg	Thr	Val	Phe	Pro	Ala	Lys	Tyr	Ala	Leu	Gly	Met	Ser	Ala	Asp	Val		
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Tyr	Lys	Ser	Trp	Asn	Phe	Asn	Glu	Gln	Ala	Leu	Pro	Ala	Asp	Leu	Val		
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Lys	Arg	Gly	Val	Ala	Val	Pro	Asp	Gln	Ser	Ser	Pro	Tyr	Gly	Val	Arg		
625					630					635					640		
Leu	Leu	Ile	Lys	Asp	Tyr	Pro	Tyr	Ala	Val	Asp	Gly	Leu	Val	Ile	Trp		
			645						650					655			
Trp	Ala	Ile	Glu	Arg	Trp	Val	Lys	Glu	Tyr	Leu	Asp	Ile	Tyr	Tyr	Pro		
		660						665					670				
Asn	Asp	Gly	Glu	Leu	Gln	Arg	Asp	Val	Glu	Leu	Gln	Ala	Trp	Trp	Lys		
		675					680					685					
Glu	Val	Arg	Glu	Glu	Ala	His	Gly	Asp	Leu	Lys	Asp	Arg	Asp	Trp	Trp		
	690					695					700						
Pro	Arg	Met	Asp	Thr	Val	Gln	Gln	Leu	Ala	Arg	Ala	Cys	Thr	Thr	Ile		
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Ile Trp Val Ala Ser Ala Leu His Ala Ala Val Asn Phe Gly Gln Tyr
725 730 735

Pro Tyr Ala Gly Tyr Leu Pro Asn Arg Pro Thr Ala Ser Arg Arg Pro
740 745 750

Met Pro Glu Pro Gly Ser His Asp Tyr Lys Lys Leu Gly Ala Gly Gln
755 760 765

Lys Glu Ala Asp Met Val Phe Ile Arg Thr Ile Thr Ser Gln Phe Gln
770 775 780

Thr Ile Leu Gly Ile Ser Leu Ile Glu Ile Leu Ser Lys His Ser Ser
785 790 795 800

Asp Glu Val Tyr Leu Gly Gln Arg Asp Glu Pro Asp Arg Trp Thr Ser
805 810 815

Asp Ala Lys Ala Leu Asp Ala Phe Lys Arg Phe Gly Ser Arg Leu Val
820 825 830

Gln Ile Glu Asn Arg Ile Lys Thr Met Asn Asp Ser Pro Asp Leu Lys
835 840 845

Asn Arg Lys Gly Pro Val Glu Met Pro Tyr Met Leu Leu Tyr Pro Asn
850 855 860

Thr Ser Asp Val Thr Gly Glu Lys Ala Glu Gly Leu Thr Ala Met Gly
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Ile Pro Asn Ser Ile Ser Ile
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 35 40 45
 Lys Thr Leu Leu Leu Glu Leu Val Ser Ser Glu Leu Asp Ala Lys Ser
 50 55 60
 Gly Val Glu Lys Thr Arg Val Thr Ala Tyr Ala His Lys Thr Leu Arg
 65 70 75 80
 Glu Gly His Tyr Glu Ala Glu Phe Lys Val Pro Ala Ser Phe Gly Pro
 85 90 95
 Val Gly Ala Val Leu Val Glu Asn Glu His His Lys Glu Val Phe Ile
 100 105 110
 Lys Glu Ile Lys Leu Val Thr Gly Gly Asp Ser Ser Thr Ala Val Thr
 115 120 125
 Phe Asp Cys Asn Ser Trp Val His Ser Lys Phe Asp Asn Pro Glu Lys
 130 135 140
 Arg Ile Phe Phe Thr Leu Lys Ser Tyr Leu Pro Ser Asp Thr Pro Lys
 145 150 155 160
 Gly Leu Glu Asp Leu Arg Lys Lys Asp Leu Gln Ala Leu Arg Gly Asp
 165 170 175
 Gly His Gly Glu Arg Lys Val Phe Glu Arg Val Tyr Asp Tyr Asp Val
 180 185 190
 Tyr Asn Asp Leu Gly Asp Pro Asp Lys Asn Pro Ala His Gln Arg Pro
 195 200 205
 Val Leu Gly Gly Asn Lys Gln Tyr Pro Tyr Pro Arg Arg Cys Arg Thr
 210 215 220
 Gly Arg Pro Arg Thr Lys Lys Asp Pro Glu Thr Glu Met Arg Glu Gly
 225 230 235 240
 His Asn Tyr Val Pro Arg Asp Glu Gln Phe Ser Glu Val Lys Gln Leu
 245 250 255

Thr Phe Gly Ala Thr Thr Leu Arg Ser Gly Leu His Ala Leu Leu Pro
260 265 270

Ala Leu Arg Pro Leu Leu Ile Asn Lys Lys Asp Leu Arg Phe Pro His
275 280 285

Phe Pro Ala Ile Asp Asp Leu Phe Ser Asp Gly Ile Pro Leu Pro Ala
290 295 300

Gln Thr Gly Phe Asp Ala Phe Arg Thr Val Val Pro Arg Met Val Lys
305 310 315 320

Leu Val Glu Asp Thr Thr Asp His Val Leu Arg Phe Glu Val Pro Glu
325 330 335

Met Ile Glu Arg Asp Arg Phe Ser Trp Phe Lys Asp Glu Glu Phe Ala
340 345 350

Arg Gln Thr Ile Ala Gly Leu Asn Pro Leu Cys Ile Gln Leu Leu Thr
355 360 365

Glu Phe Pro Ile Lys Ser Lys Leu Asp Pro Glu Val Tyr Gly Pro Ala
370 375 380

Glu Ser Ala Ile Thr Lys Glu Ile Leu Glu Lys Gln Met Asn Gly Ala
385 390 395 400

Leu Thr Val Glu Gln Ala Leu Ala Ala Lys Arg Leu Phe Ile Leu Asp
405 410 415

Tyr His Asp Val Phe Leu Pro Tyr Val His Lys Val Arg Glu Leu Gln
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Asp Ala Thr Leu Tyr Ala Ser Arg Thr Ile Phe Phe Leu Thr Asp Leu
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His Pro Xaa Xaa Lys Leu Leu Xaa Pro His Xaa Xaa Asp Thr Xaa Xaa
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Ile Asn
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 Tyr Pro Tyr Xaa Gly Xaa Xaa Xaa Asn Arg Pro Xaa Xaa Ser Arg Arg
 20 25 30

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<400> 21
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